DOCUMENT RESUME

ED 227 216 CE 032 989

TITLE Farm Water Supply and Sanitation--Pipe, Plumbing, Skills and Symbols. Student Materials. V.A. III. V-D-1, V-D-2.

INSTITUTION Texas A and M Univ., College Station. Vocational Instructional Services.

PUB DATE [80]

NOTE 29p.; For related documents, see CE 032 968, CE 032 975, CE 032 978, CE 032 980, CE 032 984, CE 032 987, and CE 032 990.

PUB TYPE Guides - Classroom Use - Materials (For Learner) (051)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.

DESCRIPTORS *Agricultural Education; *Agricultural Engineering; Blueprints; Equipment Maintenance; Equipment Utilization; Farm Management; Hand Tools; *Plumbing; *Sanitation; Secondary Education; *Vocational Education; Waste Disposal; Waste Water; *Water Resources

ABSTRACT

Designed for use by individuals enrolled in vocational agricultural classes, these student materials deal with farm water supply, sanitation, and plumbing skills. Topics covered in the unit are maintaining the farm water supply; repairing faucets and valves, leaks in pipes and storage tanks, and water closets; clearing clogged drains and traps; maintaining water systems; reading blueprints and recognizing plumbing symbols; selecting pipe, pipe fittings, valves, and plumbing tools; measuring, marking, cutting, and reaming pipe; threading galvanized and black pipe; flaring copper tubing; assembling tubing with solder fittings; measuring, cutting, and assembling cast iron pipe; making plastic-to-plastic connections; and installing sewage disposal systems. The unit includes instructional text and suggested student activities based on the text. (MN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

V. A. III
V-D-1
V-D-2

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

STUDENT MATERIALS

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY
F Ruge
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

3308

ED227216

CE032989

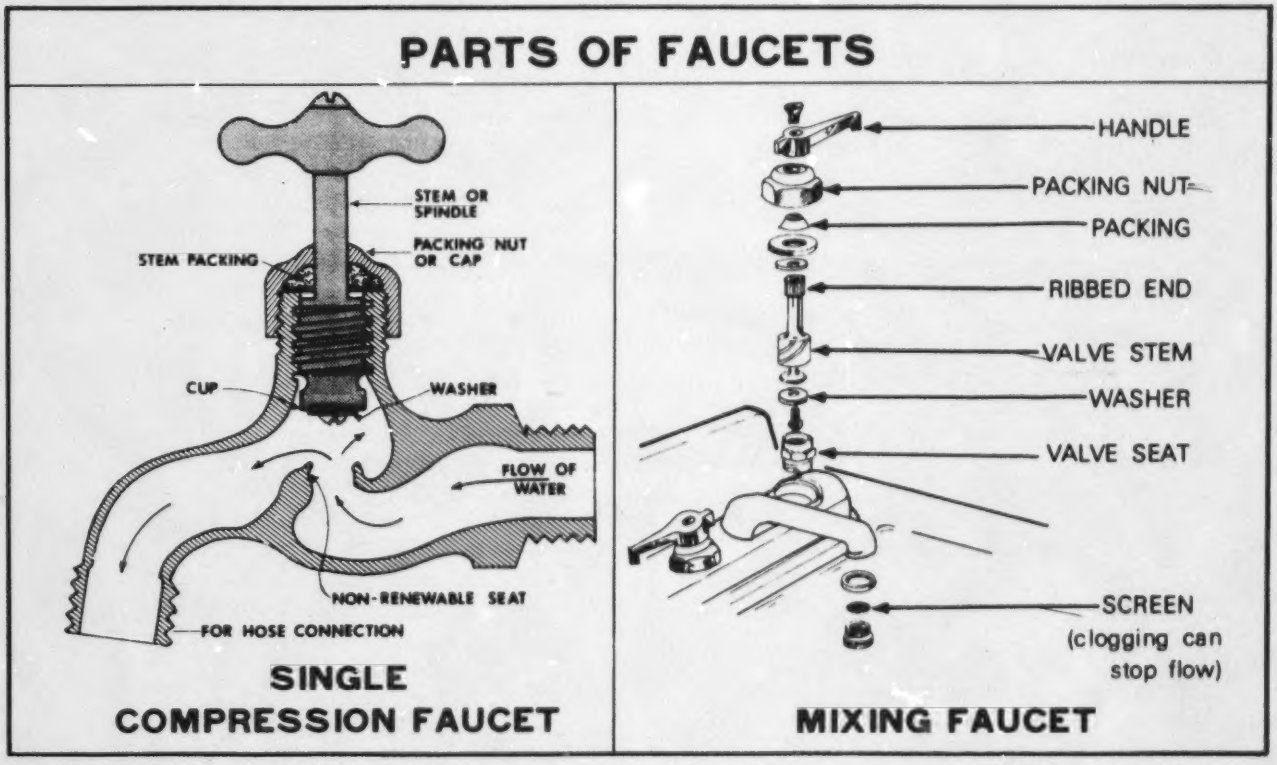
FARM WATER SUPPLY AND SANITATION - PIPE, PLUMBING, SKILLS AND SYMBOLS

1. MAINTAINING THE FARM WATER SUPPLY

In order to avoid delays, save money, and maintain a constant supply of water to farm buildings and for livestock, the farmer should be able to make minor repairs to the farm water system. If a farmer has an extensive water system or several systems, it may be wise to obtain the necessary tools and to perform the major repairs to the water system.

2. REPAIRING FAUCETS AND VALVES

Repairs to faucets and valves are possibly the maintenance jobs most often performed by the farmer. Faucets and valves are very similar, and the instructions for repairing them are the same. There are several kinds of each, but all are repaired in about the same manner.



Mixing faucets, found on sinks, bathtubs, and showers are actually two separate units. Each unit should be repaired independently. If a faucet drips when closed, or vibrates ("sings" or "flutters") when open, it usually has a worn washer. If it leaks around the spindle when open, new packing is needed around the stem.

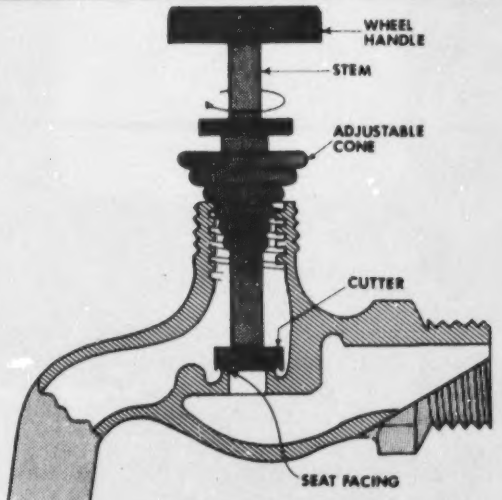
The following procedure may be used to replace the washer:

a. The water is shut off at the valve nearest to the faucet.
b. The faucet is disassembled in the following order:
   1) Handle
   2) Packing nut
   3) Packing
   4) Spindle

c. The screw and worn washer are removed from the spindle. A new washer is installed in the cup.

d. The seat should be examined. If it is rough, it should be refaced with a seat-dressing tool, which may be purchased from a hardware store.

e. The faucet is reassembled. To replace the packing, one should remove the handle, packing nut, and add packing, and install a new packing washer. If a packing washer is not available, stranded graphite-asbestos wicking may be wrapped around the spindle. The packing nut is screwed tight against the wicking.



FAUCET SHOWING SEAT BEING REFACED

3. REPAIRING LEAKS IN PIPES

Leaky pipes are usually caused by corrosion or damage from freezing, machinery, or animals. Generally when corrosion exists, it is in varying degrees for the entire length of the pipe; however, an exception to this occurs where different kinds of metal are joined, such as copper and steel. There is a tendency for different kinds of metal to corrode much faster where they are joined. It is possible at times to prevent corrosion by testing the water and taking the proper precautionary measures if they are needed. The method used to repair a leaky pipe is determined by the area in which the pipe leaks and the size of the leak. Leaks may be repaired as follows:

a. Small pipe leaks - Emergency repairs can be made with a rubber patch, metal clamp, or sleeve. However, the pipe should be replaced as soon as practical.

b. A leak at a threaded connection - This type of leak can often be stopped by unscrewing the fitting and applying a pipe joint compound. The compound, available from most plumbing supply firms, seals the joint when the fitting is screwed back together.

c. Large leaks in a pipe - There are several ways of repairing this type of leak. The old pipe can be removed and plastic pipe put in its place. (Clamps are used to hold the pipe in place.) This type of repair should not be used in the farm household. If the leak is near a joint, the damaged pipe may be cut out and a new pipe installed with the use of a union.

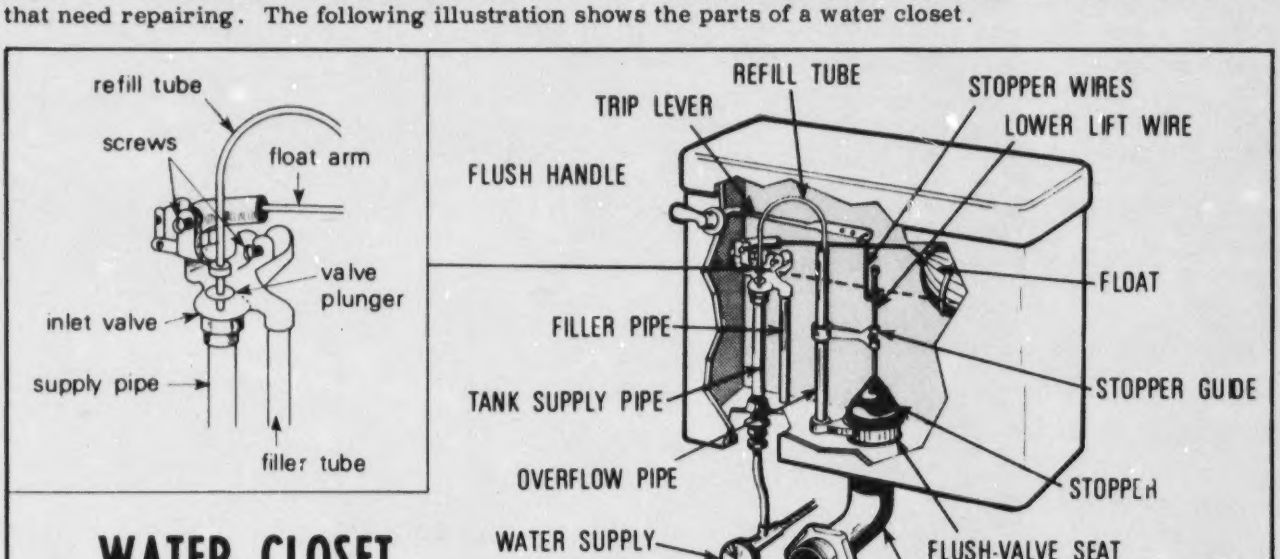
d. Leaks at solder joints - Due to vibration or some other reason, solder joints sometimes start leaking. These may be resoldered if they are accessible.

4. REPAIRING LEAKS IN STORAGE TANKS

Most farms have several tanks for storing water or other liquids. The life of these tanks may be prolonged by repairing the leaks. One method of repairing a leak in a tank is to use a rubber washer, brass washer, and toggle bolt. It may be necessary to drill the hole larger in the tank to insert the toggle bolt. The rubber washer, brass washer, and nut are placed on the toggle bolt in the order given. The toggle bolt is pushed through the hole, and the nut is tightened until the rubber washer is compressed against the tank. This repair will postpone buying a new one, but the tank will eventually have to be replaced.

5. REPAIRING WATER CLOSETS

There is some variation in the design of flush toilets, but they are enough alike that one should be able to repair them. The flush valve, inlet (float) valve, and float ball are generally the parts of the water closet that need repairing. The following illustration shows the parts of a water closet.



Repair procedures are as follows:

a. Repairing the Flush Valve - A leaky flush valve is usually caused by the decomposition of the rubber ball. It gets soft and fails to seat properly. Other parts that may cause the flush valve to leak are the trip lever, connecting rod, or lift wire. If they cannot be repaired, they should be replaced.

To replace the rubber ball, stop the flow of water by tieing the float or propping it up with a piece of wood. The lift wire is screwed out of the rubber ball and screwed into the new one. This can be accomplished without removing the tank ball guide from the overflow pipe.

b. Repairing the Inlet Valve - A worn plunger washer in the supply valve will cause this valve to leak. If the washer is not causing the leak, the float-valve assembly should be replaced. The procedure for replacing the washer is as follows:

1) The water is shut off, and the tank is drained.
2) The two thumbscrews that hold the levers are unscrewed, and the levers are pushed out.
3) The plunger is lifted out, and the cup on the bottom is unscrewed. A new washer is inserted.
4) The washer seat should be refaced if needed.

If the float ball is leaking or fails to rise to the proper position (correct water level is about one inch below the top of the overflow tube), the ball should be repaired or replaced.

c. Water Closet Bowl Removal - If the water closet bowl leaks, it may be necessary to remove it to repair the leak. The procedure is as follows:

1) The water is shut off.
2) The tank and bowl are emptied.
3) The water pipes are disconnected from the tank.
4) If it is a two-piece unit, the water bowl is disconnected from the tank.
5) The seat and cover are removed.
6) The bolt covers are removed, and the bolt holding the bowl to the floor flange is removed.
7) The bowl is repaired.
8) The tank is installed, and the water pipes are connected.
9) The bowl is checked for leaks by flushing a few times.

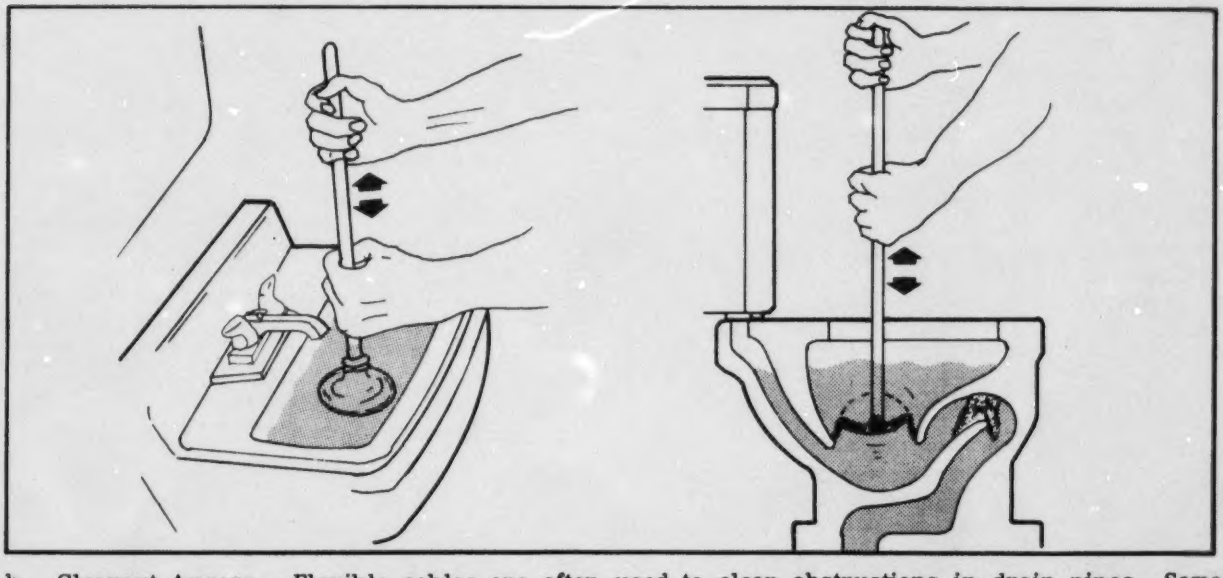
10) The seat and cover are installed.

6. CLEARING CLOGGED DRAINS AND TRAPS

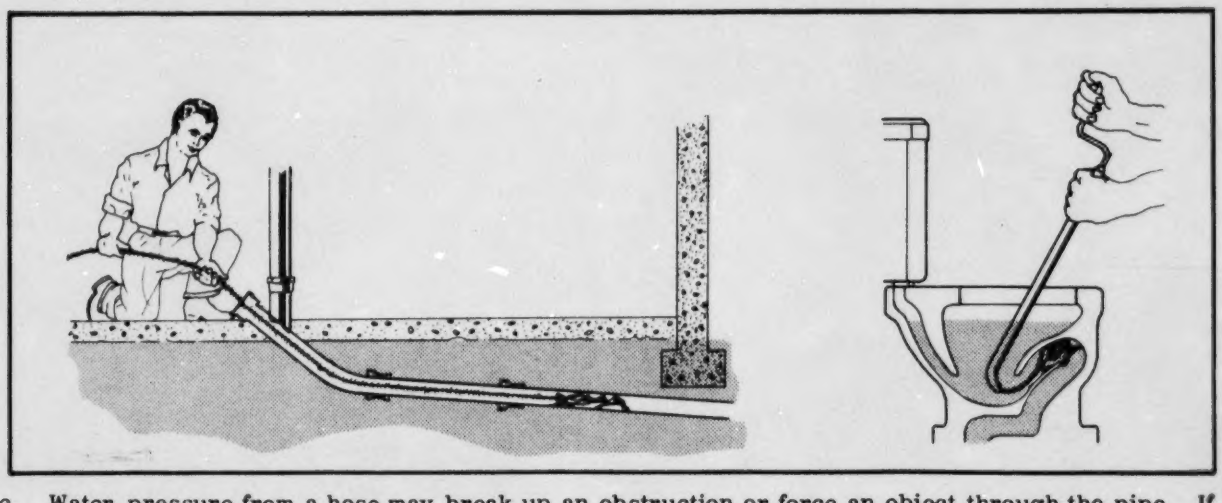
Drains become clogged by objects falling into them or by an accumulation of dirt and other matter, and they should be cleaned periodically rather than waiting until they are clogged. Periodic cleanings are much easier.

If a fixture trap is clogged, usually the trap must be removed and cleaned to unstop the drain. If a drain pipe is clogged, there are several methods that may be used to unclog the drain:

a. A plunger, often called a plumber's friend, can be used successfully sometimes to unclog drains. Water should be standing in the fixture when the plunger is used. Overflow openings should be covered to prevent air from coming in or out.

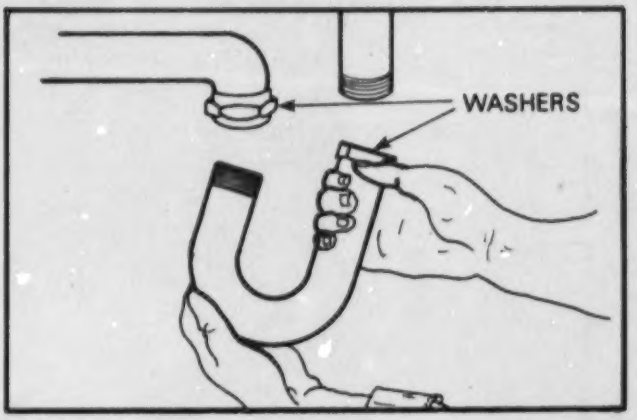


b. Cleanout Augers - Flexible cables are often used to clear obstructions in drain pipes. Some plumbers have power driven augers, and it may be necessary to secure their services if the drain is closed by root growth. If it becomes necessary to use a root saw, the drain should be eventually replaced.

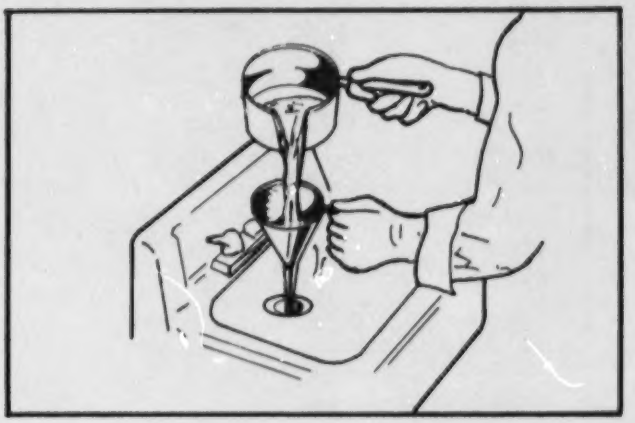


c. Water pressure from a hose may break up an obstruction or force an object through the pipe. If this method is used, the hose should be inserted well into the pipe, and rags should be wrapped around the hose where it enters the pipe to minimize a backward flow of water.

d. Removal of the lavatory trap may be necessary to unclog the drain. Use of a bucket to catch water spillage is necessary. When replacing the trap, make certain that the rubber washers are firm and tight to prevent leaking.



e. Chemical cleaners are an effective means of loosening grease and soap from pipes; however, they should not be used in pipes that are completely stopped up. They must be brought in direct contact with the stoppage to be effective. After chemicals are used, the pipe should be flushed with cold water. Do not allow the chemical to come into contact with porcelain finish or damage may occur. Care should be taken to avoid breathing fumes released by the chemical reaction.



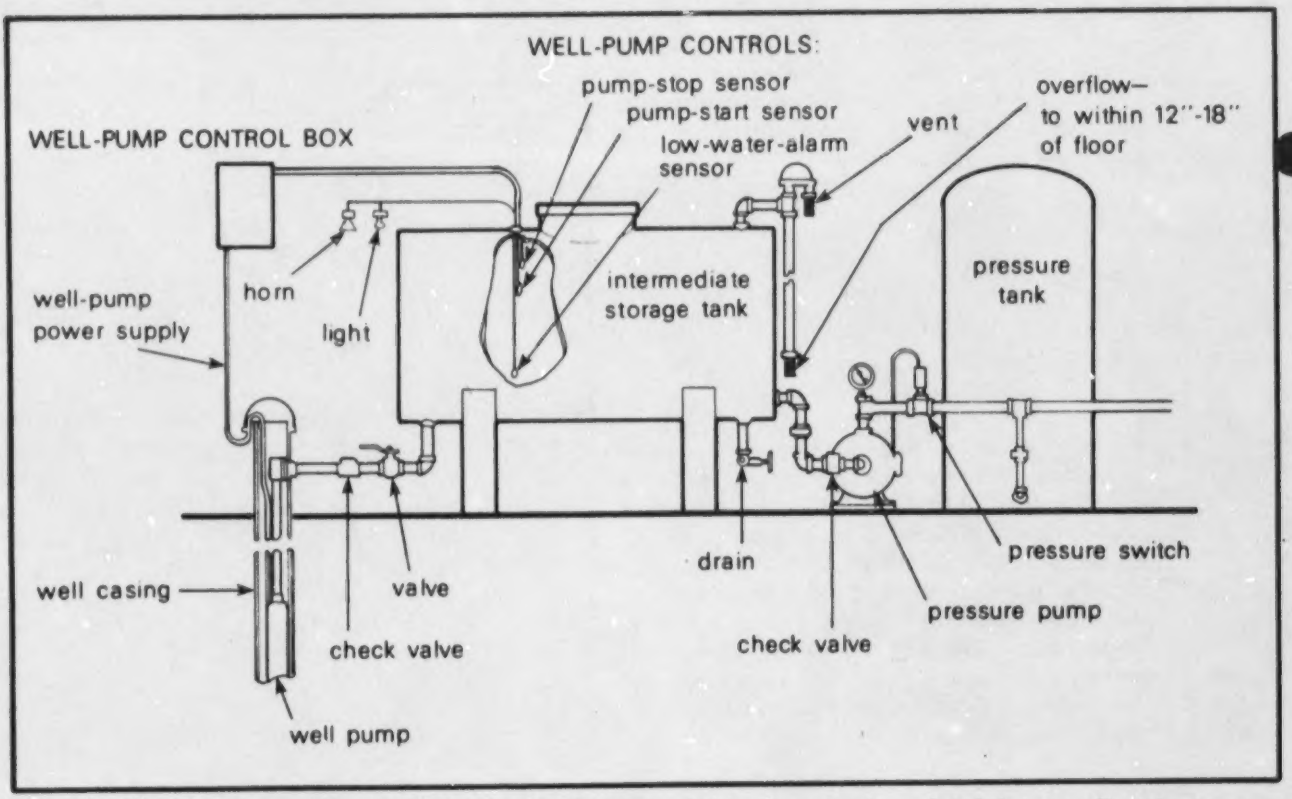
7. MAINTAINING WATER SYSTEMS

The two most common water systems found on farms are the gravity flow system and the pressure system. Each system is discussed separately.

Gravity Flow System - If the gravity system is used, a pump and storage facility must be maintained to provide an adequate water supply. The maintenance problems usually connected with a gravity flow system are the repairing of leaks and the maintaining of an adequate flow of water. The water pressure in this system depends upon the height of the storage tank above the water-use outlets. Observing the daily water consumption on the farm will assist the farmer in detecting leaks. If an abnormally large amount of water is used during a short period, or if there has been a considerable increase in water consumption without an apparent reason for the increase, there is a possibility that the system is leaking. Underground leaks are difficult to detect. If after walking along the routes of the underground pipes, the farmer has not detected a leak, indicated by a wet or damp spot, a part of the water system should be turned off to determine the area of greatest consumption. If the area of the leak can be determined, all connections should be checked for leaks. If the leak is still undetected, it may be necessary to dig up some of the pipe.

Since the maintenance problems of wells and pumps are similar, regardless of the kind of water system, pump and well maintenance is discussed under the pressure system.

Pressure System - Troubles with a pressure system are more difficult to determine because of the automatic controls and safety devices.



The following list of possible problems shows what one might encounter in maintaining a well and pressure system and the areas that should be checked to eliminate the problem:

a. The Pump Fails to Deliver Water
   1) Air leak in suction pipe
   2) Water level below the end of the suction pipe
   3) Pump lost prime
   4) Stuck foot valve
   5) Plugged suction
   6) Dry well
   7) Plugged jet
   8) Cracked cylinder
   9) Worn leathers (reciprocating pump)
   10) Worn valve on jet pump
   11) Broken plunger rod

b. Pump Fails to Deliver a Normal Amount of Water
   1) Pipe valve leaking
   2) Cracked cylinder
   3) Air in suction pipe
   4) Belt to motor is too loose
   5) Low voltage
   6) Suction pipe too small
   7) Improper setting on pressure regulator

c. Pump Stops and Starts Oiten
   1) Not enough air in pressure tank
   2) Leaky foot valve
   3) Leak in plumbing
   4) Tank too small
   5) Air pump out of order

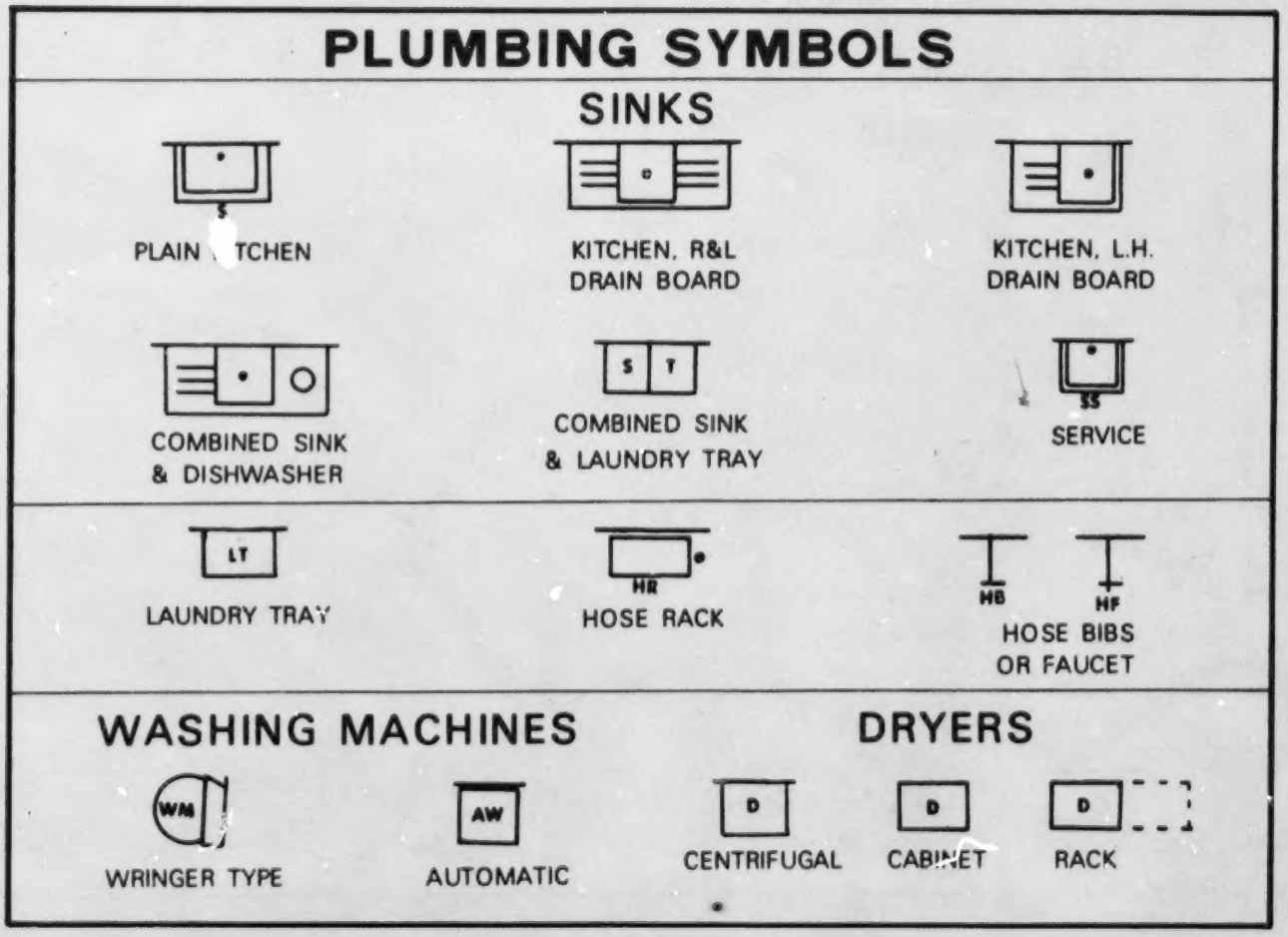
d. Air Spurts from Faucets
   1) Too much air in tank

e. Pump Motor Fails to Run
   1) Power off
   2) Broken power line
   3) Blown fuse
   4) Circuit breaker open
   5) Burned motor
   6) Reset fuse blown
   7) Malfunctioning motor switch

8. READING BLUEPRINTS AND RECOGNIZING PLUMBING SYMBOLS

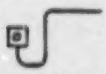
Before installing plumbing (considered to be any part of the water or waste disposal system) on the farm, or in a farm structure or dwelling, the farmer should have a detailed set of plans for the proposed plumbing. The preparation of detailed plans requires a lot of planning and forethought on the part of the farmer, as well as possibly securing the assistance of a professional plumber. In planning an adequate water and waste disposal system, there are several factors that must be considered. Some of these factors are source and availability of power (generally electricity), amount of water or other utilities needed at different locations, distance from source to outlets, pump capacity, storage capacity, the possibility of future expansion (it is expensive to install larger fittings and other plumbing when remodeling), electrical protection, size and kind of pipe and fixtures available, and cost.

There are certain plumbing symbols which make it easier to prepare drawings and blueprints of a plumbing system. In order to plan a farm water system and to read blueprints, a farmer must be able to recognize these symbols. Some of the symbols are shown in the following illustrations.

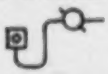


DRAINAGE SYMBOLS

DRAIN



GARAGE DRAIN



FLOOR DRAIN, WITH BACKWATER VALVE

LAMP HOLE DRAIN

LEADER DRAIN

DRY WELL

RECEIVING BASIN

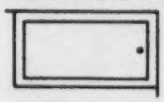
YARD DRAIN INLET

WATER CLOSETS

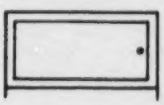
LOW TANK

NO TANK
(FLUSH VALVE)

BATHS



CORNER

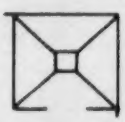


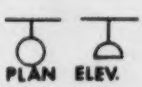
RECESSED

ANGLE TUB

SHOWERS

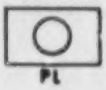
SHOWER STALLS





SHOWER HEAD

LAVATORIES



PEDESTAL

WALL

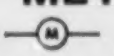
CORNER

HOT WATER

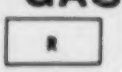
TANK

HEATER

METER



GAS RANGE



OUTLETS

GAS

PLUMBING SYMBOLS

PLUMBING

- SOIL, WASTE OR LEADER (ABOVE GRADE)
- SOIL, WASTE OR LEADER (BELOW GRADE)
- VENT
- COLD WATER
- HOT WATER
- HOT WATER RETURN
- FIRE LINE — F
- GAS — G
- ACID WASTE — ACID
- DRINKING WATER FLOW
- DRINKING WATER RETURN
- VACUUM CLEANING — V
- COMPRESSED AIR — A

SPRINKLERS

- MAIN SUPPLIES — S
- BRANCH AND HEAD
- DRAIN — S

PNEUMATIC TUBES

- TUBE RUNS

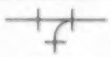
DRAINAGE

- SEWER-CAST IRON — S-CI
- SEWER-CLAY TILE, BELL & SPIGOT — S-CT
- DRAIN-CLAY TILE, BELL & SPIGOT
- DRAIN-OPEN TILE OR AGRICULTURAL TILE

PLUMBING SYMBOLS - PIPE FITTINGS

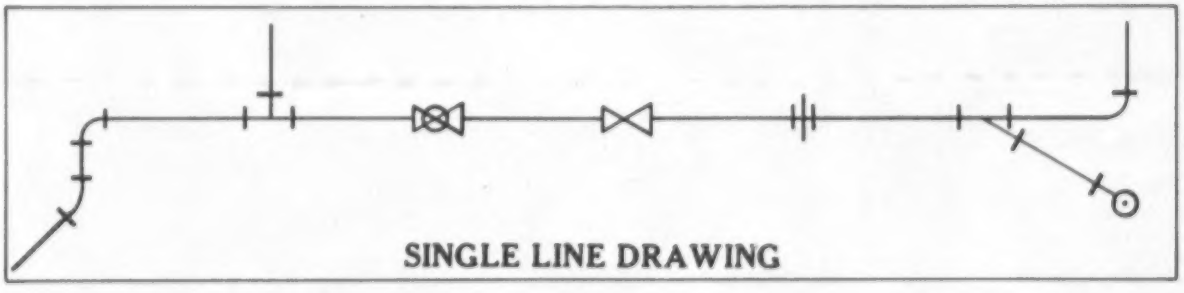
FITTING	SOLDERED	SCREWED	BELL & SPIGOT
JOINT			
ELBOW-90°			
ELBOW-45°			
ELBOW-TURNED UP			
ELBOW-TURNED DOWN			
ELBOW-LONG RADIUS			
SIDE OUTLET ELBOW OUTLET UP			
SIDE OUTLET ELBOW OUTLET DOWN			
BASE ELBOW			
DOUBLE BRANCH ELBOW			

PLUMBING SYMBOLS - PIPE FITTINGS (cont.)

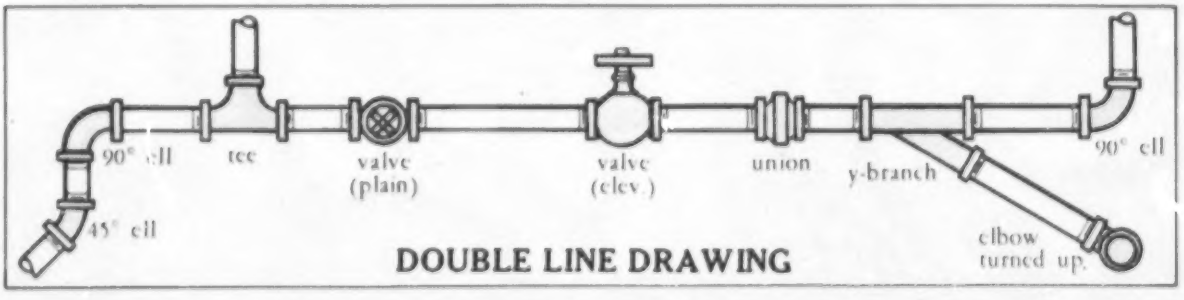
FITTING	SOLDERED	SCREWED	BELL & SPIGOT
REDUCING ELBOW			
SINGLE SWEEP TEE			
DOUBLE SWEEP TEE			
TEE			
TEE-OUTLET UP			
TEE-OUTLET DOWN			
SIDE OUTLET TEE OUTLET UP			
SIDE OUTLET TEE OUTLET DOWN			
CROSS			

Blueprints or drawings are necessary to determine the amount of pipe and fixtures needed for a plumbing job. They are also used as installation plans and help to determine costs. Plumbing drawings may be of two kinds, single line or double line.

EXAMPLES OF SINGLE AND DOUBLE LINE DRAWINGS



SINGLE LINE DRAWING



DOUBLE LINE DRAWING

11

9. SELECTING PIPE

The farmer has several choices when selecting the pipe to use for a given plumbing job. The different kinds of pipe, based on the materials used in their construction, are galvanized steel, black steel, copper, brass, cast iron, and plastic. All of the pipe listed is not necessarily recommended for all plumbing jobs. General information about each kind of pipe is discussed as follows:

Galvanized Pipe - More galvanized pipe is used for plumbing than any other kind. It is very durable and will last thirty to forty years under normal conditions. Galvanized pipe corrodes rather easily in alkaline and acid water and will burst if frozen. It can be purchased in three different weights: standard, extra strong, and double extra strong. The outside diameter of each weight is the same; however, the metal of the extra strong and double extra strong is thicker. The extra strong and double extra strong are usually connected by flanges or welded; therefore, these are not usually used on farm plumbing jobs. Standard galvanized pipe can be purchased in a wide range of sizes. One-eighth inch is the smallest size, while twelve inches is the largest. Pipe size is determined by the diameter of the pipe opening or inside pipe size.

Black Steel Pipe - Black steel pipe may be purchased in the same sizes as the galvanized pipe. Because it corrodes so quickly, black steel pipe is not used on most plumbing jobs. It may be used as gas lines in areas where the pipe is protected from the weather and soil. It is the most economical pipe to buy.

Brass and Copper Pipe - Brass and copper pipes are interchangeable, but more copper is used than brass. There are two kinds of copper tubing, type K, a heavy duty pipe, and type L, the standard copper pipe. Copper tubing is resistant to corrosion and has a life expectancy of forty to 100 years. It can freeze several times before it will burst. Copper tubing is particularly useful in areas where rigid pipes are difficult to lay. It may be purchased in twenty-five foot coils, and there are nine outside dimension sizes from 1/8" to 1".

Plastic Pipe - There has been an increase in the amount of plastic pipe being used on farms. One of the reasons for this increase is the improvement in the quality of the pipe. Plastic pipe is easily laid and does not require any special tools. However, it is easily punctured, loses its strength under prolonged exposure to weather, and should not be used for hot water runs. Most city plumbing ordinances prohibit the use of plastic pipe inside of a home. It is available as rigid plastic pipe in 10-foot lengths and flexible plastic pipe in 60-foot coils. Several grades are available. If the pipe is to be used several years, the most ecomomical plastic pipe to purchase is the best quality. Both fiber and plastic pipes are available in four-inch sizes and ten-foot lengths. There is also the perforated type used for septic tank drainage and subsurface field drainage. The solid type is used for house - to sewer, downspout drainage and on non-pressure uses. Pipe are joined by driving them into a self sealing coupling.

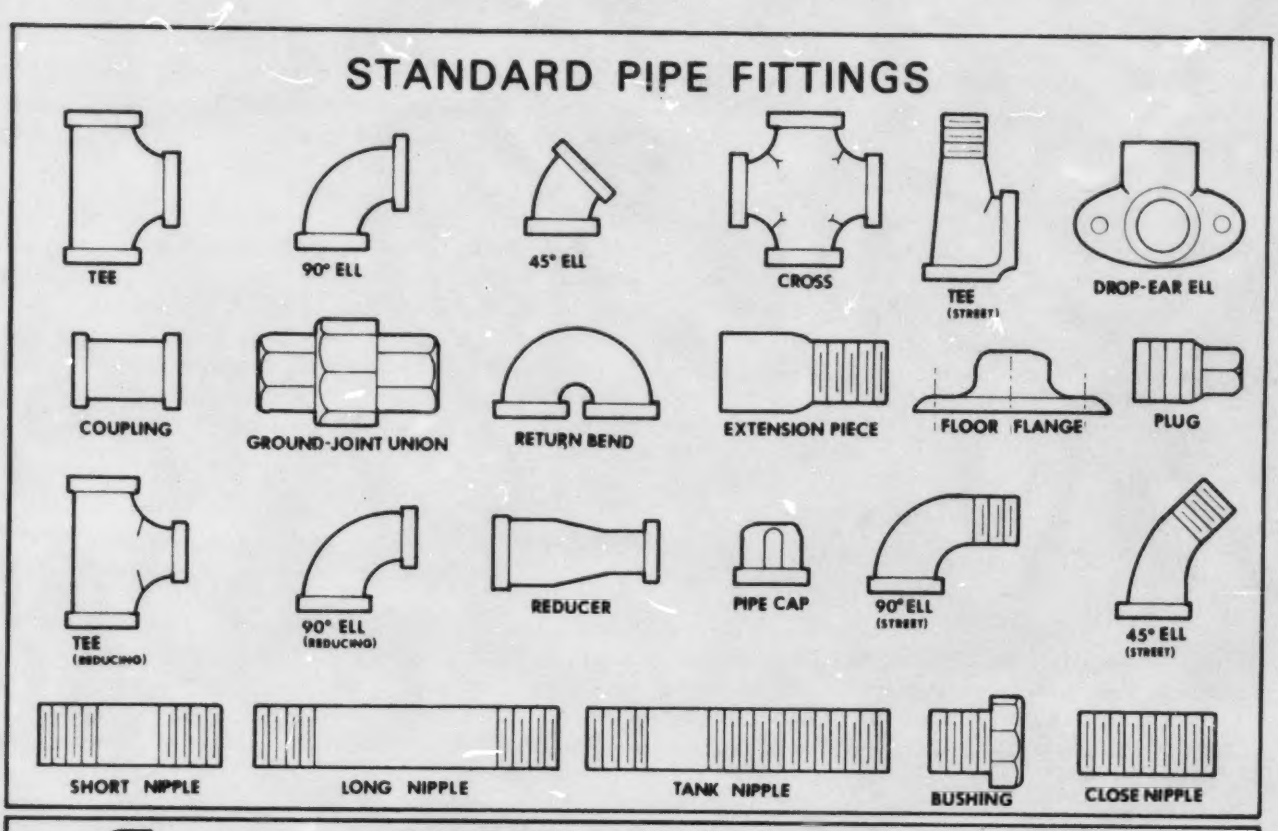
Cast Iron Pipe - Cast iron pipe is used for drains and vents. The pipe ranges in size from two to twelve inches in diameter. The pipe may be purchased in five-foot lengths and in both single and double hubs (explained later). Cast iron pipe does not corrode and will last indefinitely.

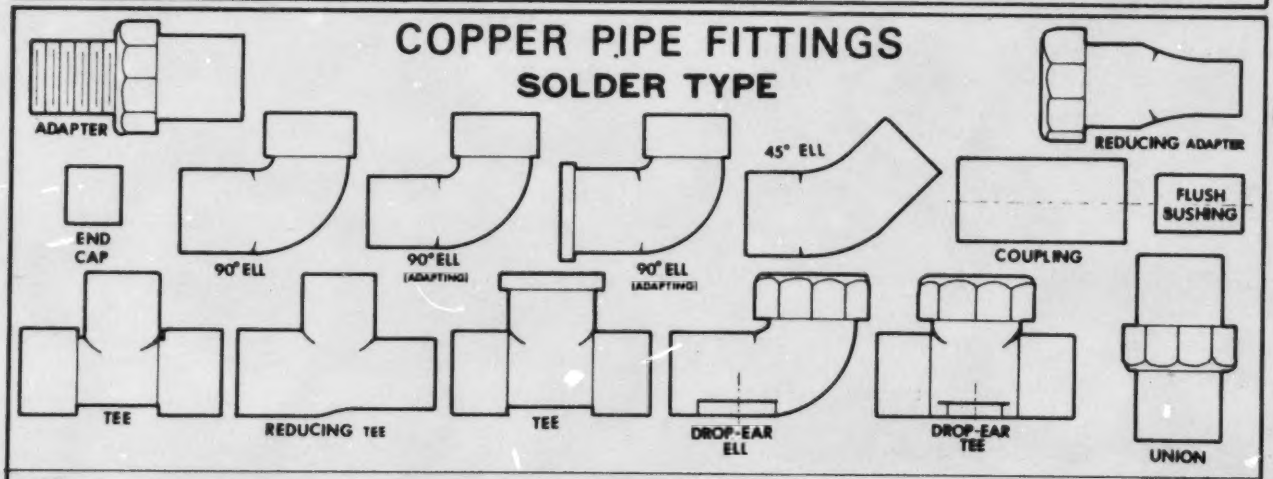
After reviewing the advantages and disadvantages of the different kinds of pipe and the recommended uses of certain pipe, the following factors should be considered in determining the kind of pipe to use on a given job: mineral or chemical content of water; resistance to corrosion; life expectancy; recommended pressure; resistance to deposits; the use of the pipe; lengths available; and the cost.

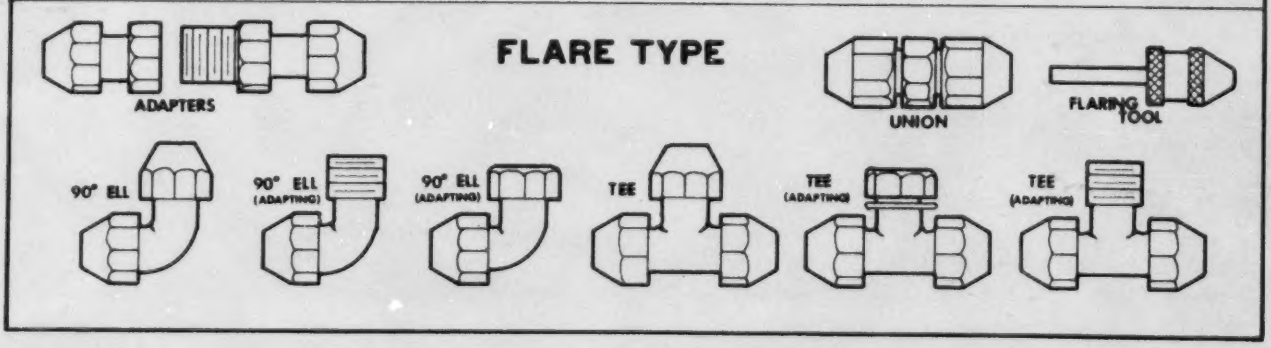
To determine the size of pipe needed, consider the following factors: amount of water needed at the outlet; expected increase in water use at the outlet; and the distance water must travel from the source to outlet.

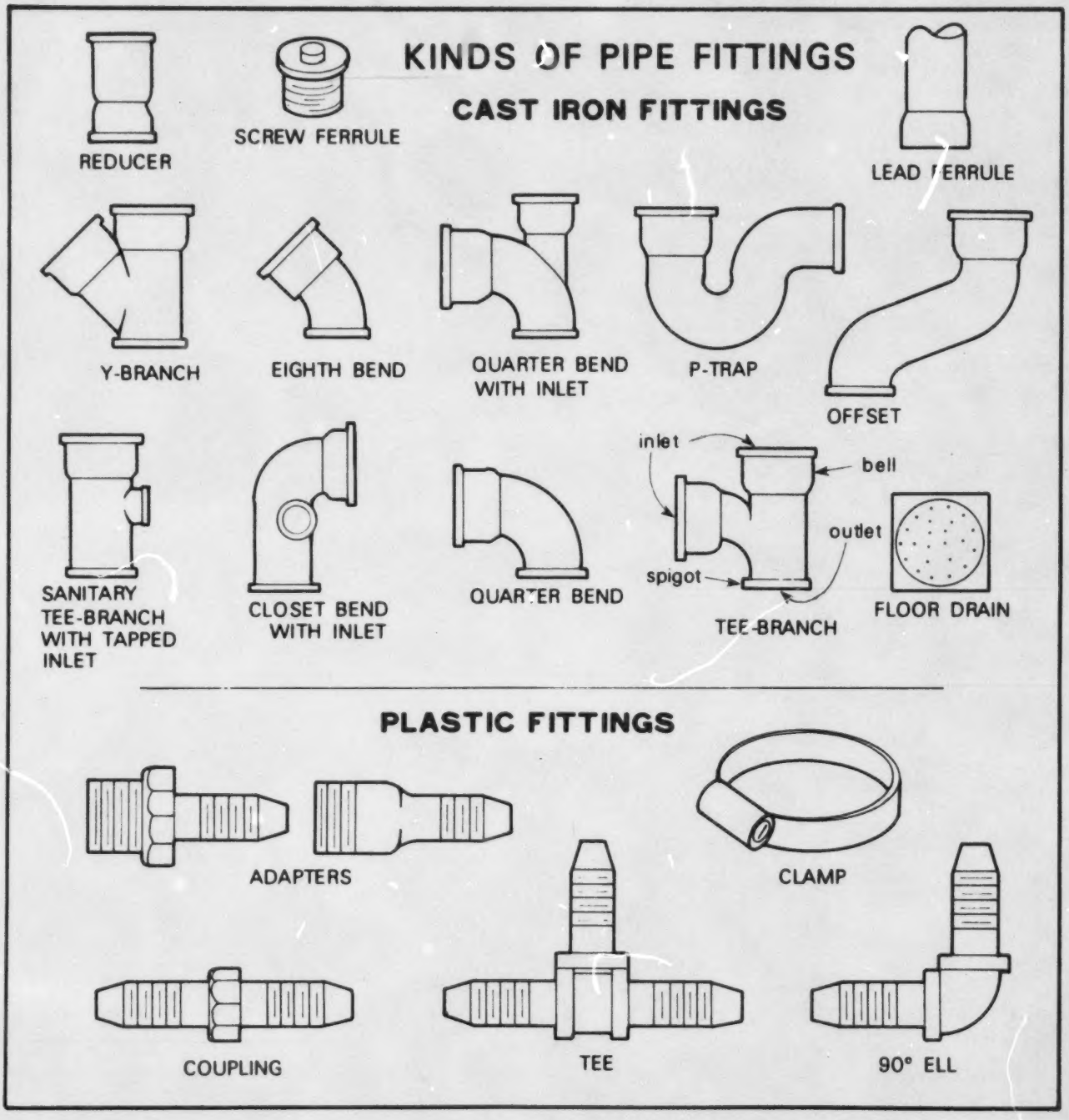
10. PIPE FITTINGS

A part of any plumbing skill will be in developing the ability to recognize the different kinds of pipe fittings. Fittings can be purchased in the same sizes as pipe. Some fittings that may be used with different kinds of pipe are shown in the following illustrations.


STANDARD PIPE FITTINGS
TEE
90° ELL
45° ELL
CROSS
TEE (STREET)
DROP-EAR ELL
COUPLING
GROUND-JOINT UNION
RETURN BEND
EXTENSION PIECE
FLOOR FLANGE
PLUG
TEE (REDUCING)
90° ELL (REDUCING)
REDUCER
PIPE CAP
90° ELL (STREET)
45° ELL (STREET)
SHORT NIPPLE
LONG NIPPLE
TANK NIPPLE
BUSHING
CLOSE NIPPLE


COPPER PIPE FITTINGS
SOLDER TYPE
ADAPTER
REDUCING ADAPTER
END CAP
90° ELL
90° ELL (ADAPTING)
90° ELL (ADAPTING)
45° ELL
COUPLING
FLUSH BUSHING
TEE
REDUCING TEE
TEE
DROP-EAR ELL
DROP-EAR TEE
UNION


FLARE TYPE
ADAPTERS
UNION
FLARING TOOL
90° ELL
90° ELL (ADAPTING)
90° ELL (ADAPTING)
TEE
TEE (ADAPTING)
TEE (ADAPTING)



The plastic fittings shown here are used with a clamp. There are also plastic fittings that may be glued to the pipe.

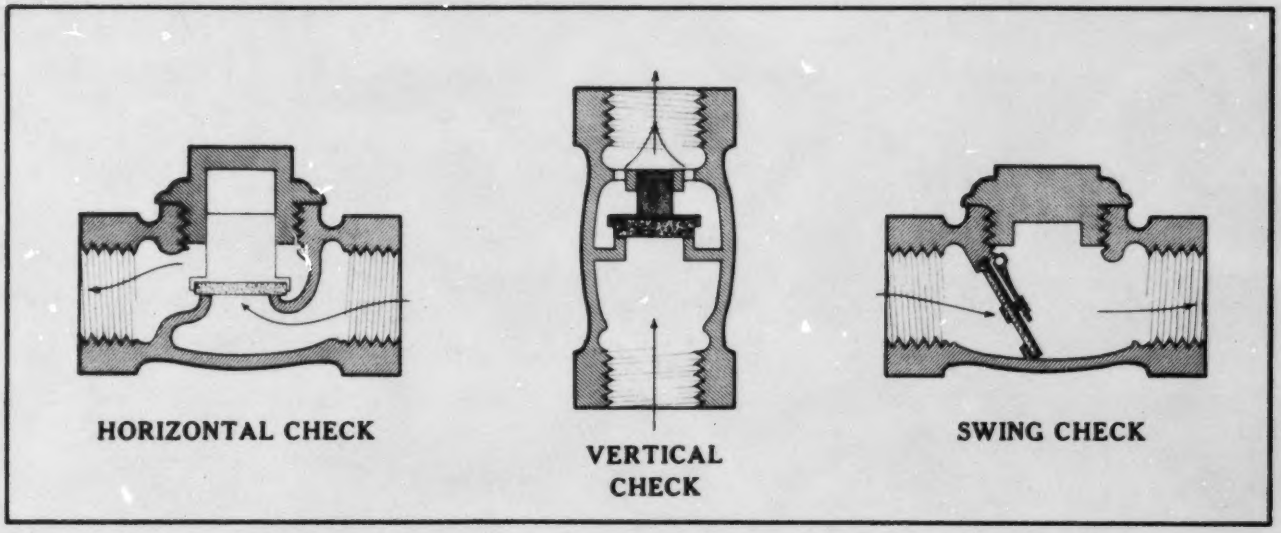
The purposes of fittings are to: connect pipe; change direction of pipe; reduce the pipe size; and, plug pipe. Fittings have the same inside dimensions as the pipe they are used on and are designated by the size of pipe they fit. For example, one-inch tees fit one-inch pipe.

11. VALVES

There are several kinds of valves used in plumbing. The most common are the safety, check, hydrant, stop and waste, gate, and globe. Safety valves are used on hot water heaters to release water and temperature. When the pressure on the spring is exceeded by the pressure under the seat, the seat is lifted,

and water and air flow through.

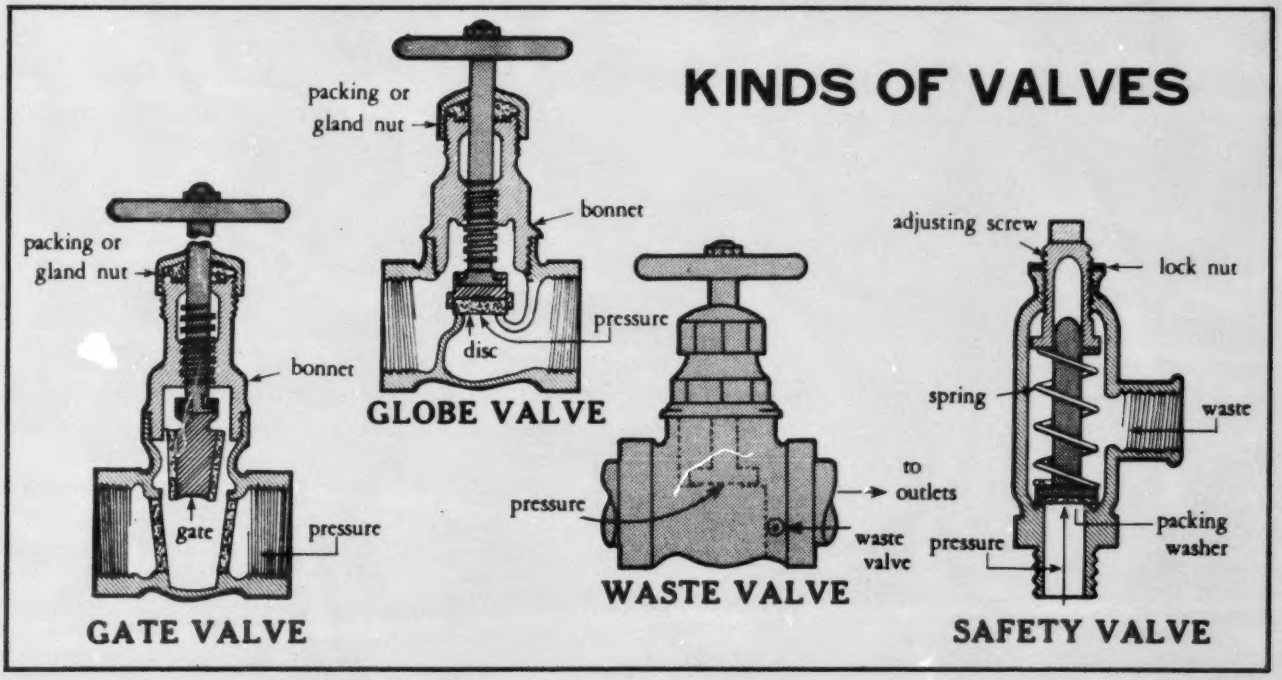
Check valves are used to prevent a backflow of water. They are automatic and open and close with the direction of flow.



Globe valves are used to cut off the flow of water or to drain the water line. It should be installed with the pressure under the valve seat. Otherwise, it will leak. The gate valve is used the same way as a globe valve. It has an advantage over the globe valve: it will not restrict the flow of water.

There are two types of stop and waste valves, globe and ground key. They are used to shut off the pressure and drain the line.

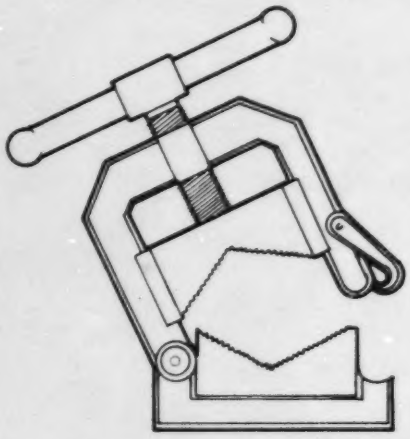
A hydrant valve is similar to a stop and waste valve. When the water is turned off, the pipe is drained from the surface back to the valve. This prevents freezing in cold weather.



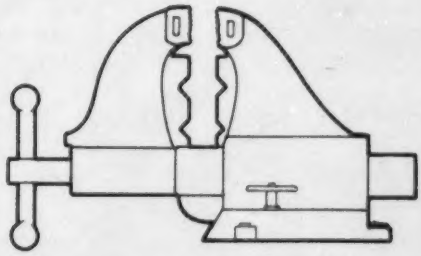
12. PLUMBING TOOLS

In order to install pipe and plumbing, certain tools are needed. The following illustrations show some of the tools needed in plumbing jobs.

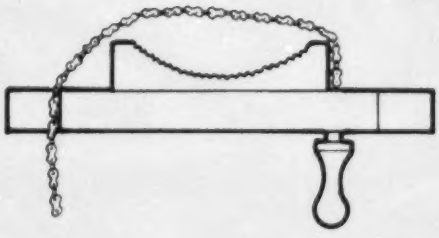
TYPES OF VISES



HINGED PIPE VISE

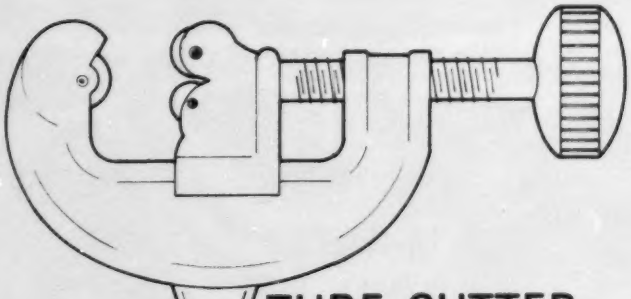


COMBINATION PIPE VISE

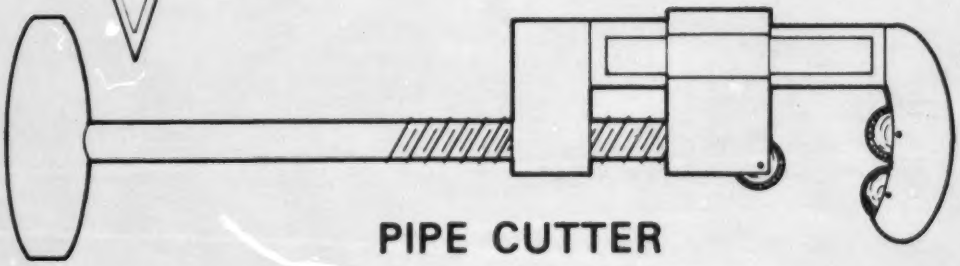


CHAIN PIPE VISE

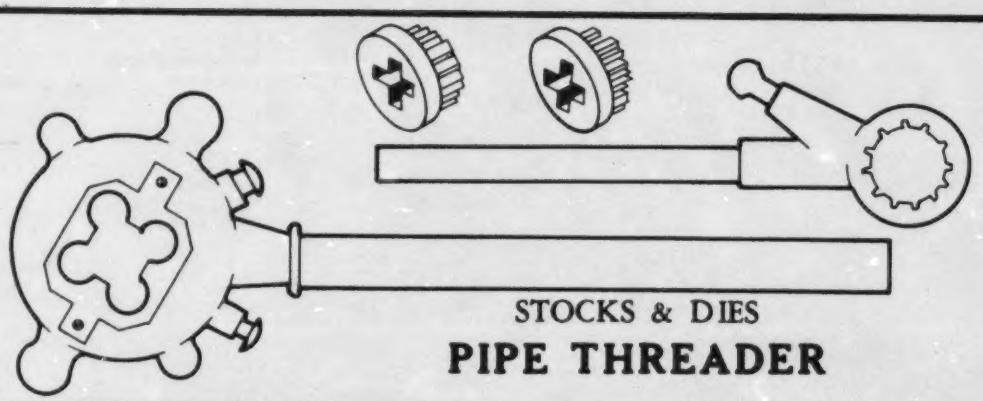
TYPES OF CUTTERS



TUBE CUTTER

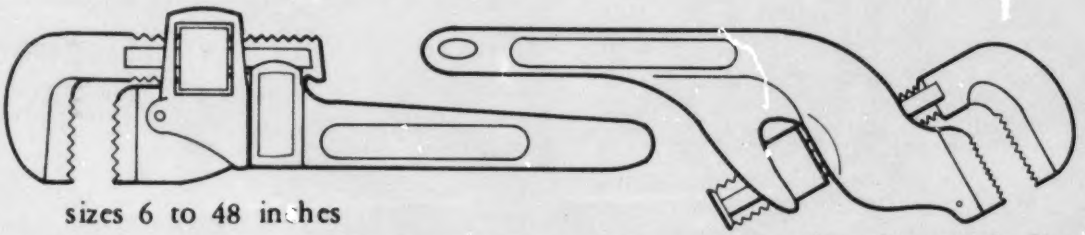


PIPE CUTTER



STOCKS & DIES

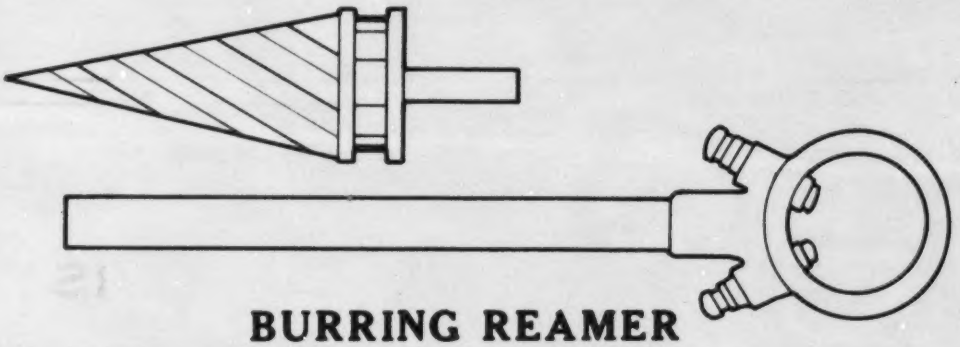
PIPE THREADER



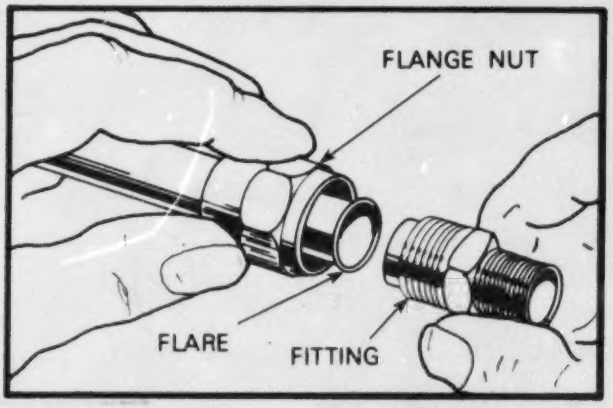
sizes 6 to 48 inches

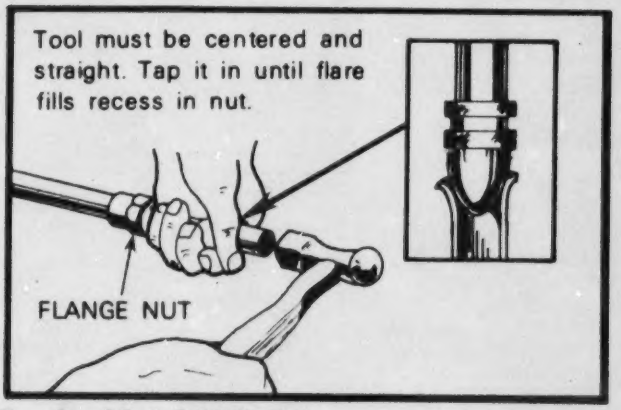
sizes 6 to 36 inches

PIPE WRENCHES

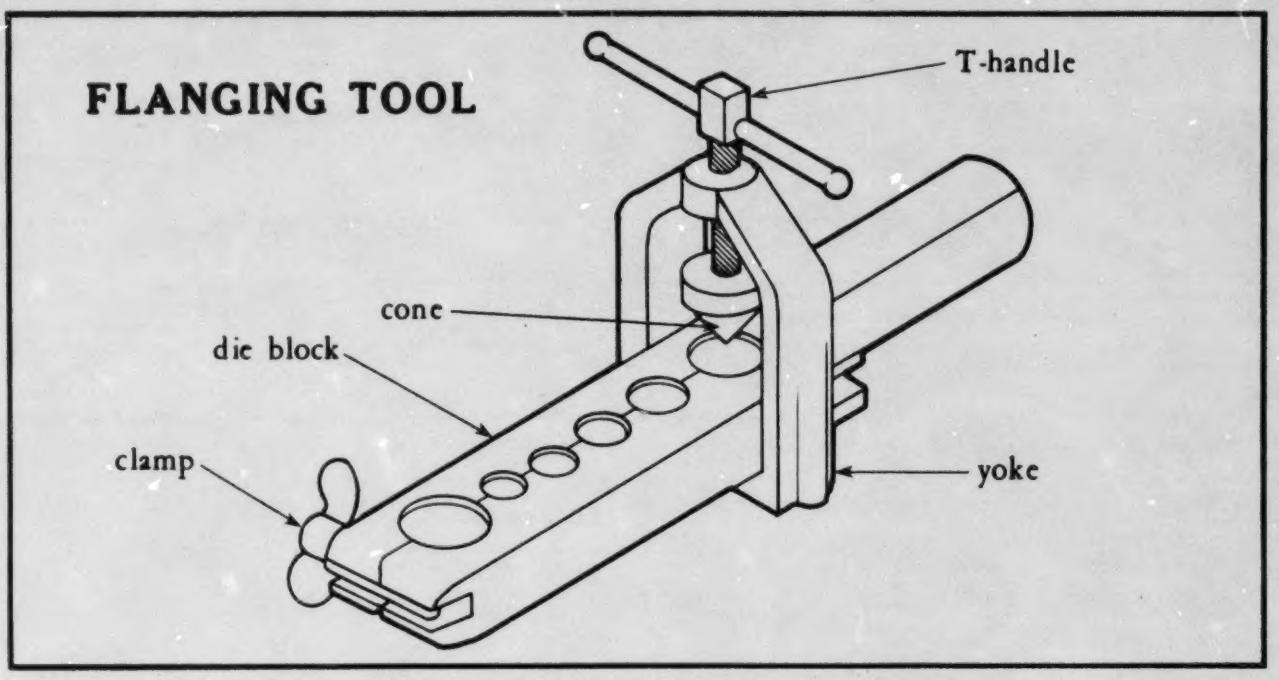


BURRING REAMER



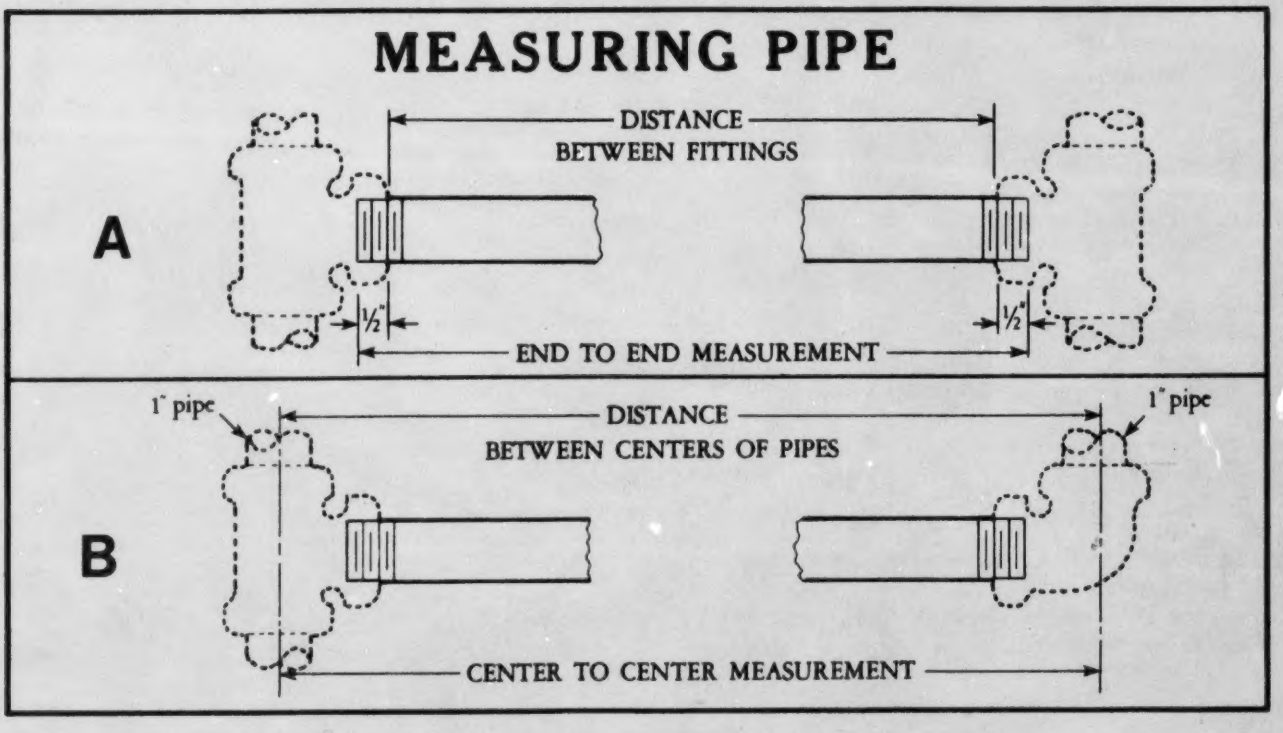


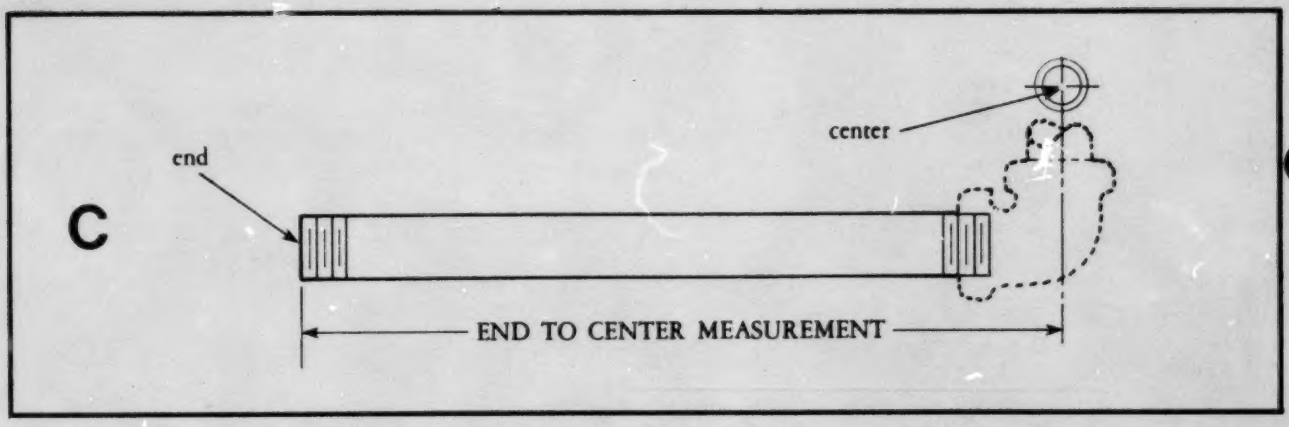
FLARING TOOL & HAMMER



13. MEASURING, MARKING, CUTTING, AND REAMING PIPE

To accurately measure the length of a pipe, one must know the distance that the pipe screws into the fitting and the distance taken up by the fitting. Different size pipe and fittings require different distances. Charts are available that give the distances taken up by fittings and the distance pipe is screwed into fittings. The following illustration shows the area to measure to determine the length of several fittings. After using various fittings on plumbing jobs several times, one will learn the distances taken up by each size fitting.





Measuring Pipe: There are three methods of measuring pipe:

a. The distance between the fittings is measured, and an allowance is made for the thread that screws into the fitting. One-half inch should be allowed for the fitting if one-inch pipe is used, and three-fourths of an inch of thread is allowed for pipe 1¼ inches to two inches in diameter. This method should not be used when accurate measurements are needed.

b. A more accurate method for measuring pipe is to measure the distance from the center of one pipe to the other pipe (as shown in Figure B) and subtract the diameter of the pipe for each thread. A farmer using one-inch pipe, for example, would subtract two inches from the length of the pipe, one inch for each end of the pipe.

c. When pipe larger than 1¼ inches in diameter is used, the distance to the center of the pipe is measured, and the fittings are measured from the center of the pipe to the back of the thread of the fitting. See Figure C.

Marking Pipe - The length of the pipe may be measured with a ruler or tape measure, and the pipe should be marked with the edge of a three-cornered file.

Cutting Pipe - To prepare pipe for cutting, the farmer should fasten the pipe in a pipe vise with the mark made by the file approximately four inches in front of the vise. The procedure for cutting the pipe is as follows:

a. The opened pipe cutter is slipped over the pipe, and the cutter handle is turned until the wheels are snug against the pipe at the mark.

b. A few drops of oil (cutting oil) are placed on the mark.

c. The pipe cutter is turned around the pipe, and the screw handle is turned one-fourth turn each revolution of the cutter until the pipe is cut off.

d. The reamer is used to remove the burr that is left on the inside of the pipe after it is cut. If the burr is left in the pipe, it will restrict the flow of water.

14. THREADING GALVANIZED AND BLACK PIPE

A pipe thread is tapered so that it will make a tight joint when the fitting is screwed onto the pipe. In order for the joint to be tight, the thread must be cut properly. The procedure for cutting a pipe thread is as follows:

a. The pipe is cleaned of dirt, rust, and other materials.

b. The rough edges are removed from the end of the pipe to be threaded.

c. The pipe is secured in a vise.

d. Cutting oil or lard oil is applied to the die.

e. Inward pressure is applied to the die as it is turned on the pipe. After the die becomes engaged on the pipe, the inward pressure should be discontinued.

f. The pipe should be oiled frequently ahead of the die.

g. The threading is continued until one thread is showing outside of the die. More threads should be showing on large pipe. The die should never be turned backwards or back and forth. This will ruin the threads.

h. The die is backed off of the threads carefully. If the die should catch, it should be turned forward again to dislodge the metal chips.

i. The pipe is cleaned of oil and removed from the vise. The die also should be cleaned.

15. FLARING COPPER TUBING

When flare type fittings are used, it is necessary to make a flare at the ends of the tubing. The procedure for flaring the tubing is as follows:

a. A sleeve nut is slipped on the section of copper tubing.

b. The burr, if present, should be removed from the end of the tubing.

c. The tubing is wrapped with cloth or leather (to prevent marring) and placed in a vise.

d. A few drops of oil are applied to the flaring tool.

e. The flaring tool is placed over the end of the tubing, and the tubing is placed flush with the surface of the tool.

f. The flaring tool is screwed into the end of the tubing to make a flare.

g. The flare tool is removed, and the sleeve nut is placed in position. The flare end is now ready to be placed on the fitting.

16. ASSEMBLING TUBING WITH SOLDER FITTINGS

A gas soldering or brazing torch is recommended for soldering fittings. Also, a flux, recommended for use with the solder, should be used. The following is a step procedure for assembling copper pipe with solder fittings:

a. The copper tubing is cut square, and the burr is removed.

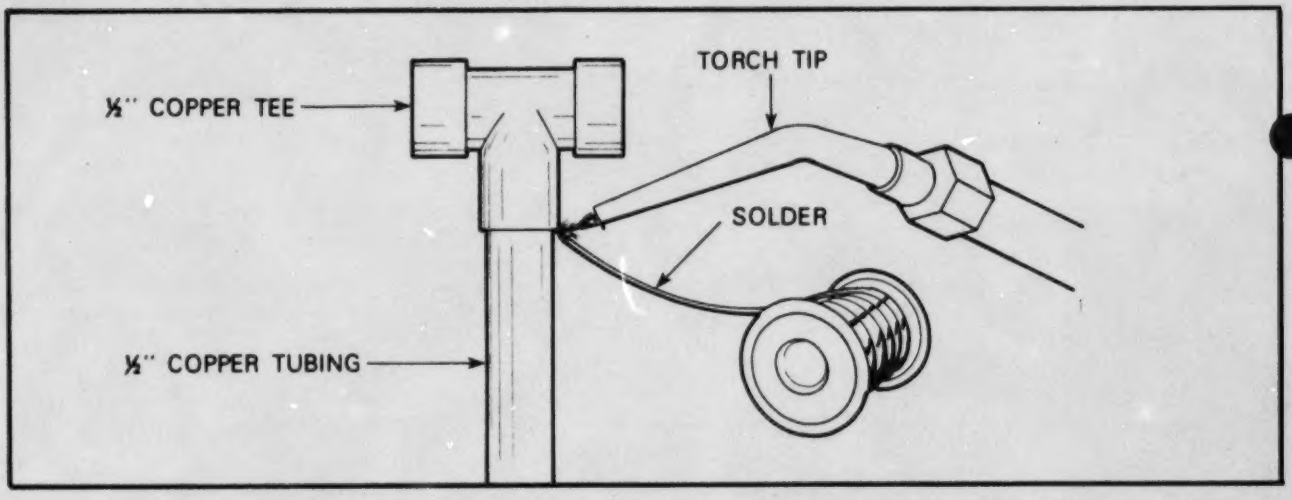
b. The outside area of the tubing that will be covered with the fitting is cleaned thoroughly.

c. The inside of the fitting is cleaned thoroughly.

d. Flux is applied to the cleaned portion of the tube.

e. The fitting is placed on the tubing, pushed against the shoulder of the fitting, and is turned several times to distribute the flux.

f. Heat is applied until the flux boils and the copper will melt solder.



g. Solder is applied until it appears completely around the edge of the fitting. Because of the close fit of the fitting and the pipe, the solder will flow by capillary action throughout the joint when the joint is properly heated. This action is in every direction -- up, down, or sideways. The flame should be removed from the joint as quick as the joint is filled with solder. Excessive heat will cause the solder to boil out of the joint.

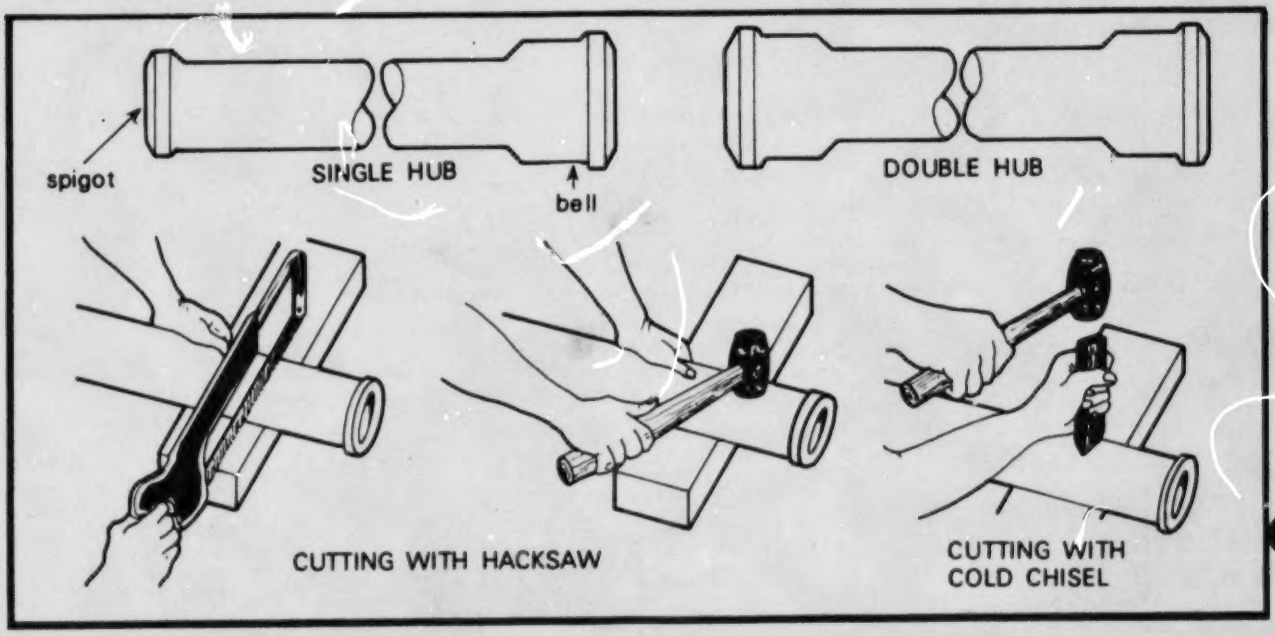
h. Allow the joint to cool.

17. MEASURING, CUTTING, AND ASSEMBLING CAST IRON PIPE

This type of pipe is often referred to as cast iron soil pipe because it is used for drains and vents and is in contact with the soil.

When measuring cast iron pipe, an allowance should be made for the hub. Different size pipes require different allowances. After the pipe has been measured, a mark, which will indicate the area to cut, should be made with chalk around the pipe.

When ordering cast iron pipe, the farmer should order enough double hub pipe to make all of the cuts from. Cast iron pipe may be cut by three methods: a cast iron pipe cutter, a hacksaw, or a chisel.



If a hacksaw is used, a 1/16-inch deep cut is made around the pipe After the cut is made, the pipe is tapped with a hammer until it breaks. The hacksaw should be used only on service weight pipe. A cutter or a cold chisel should be used on heavier pipe.

When a cold chisel is used to cut the extra heavy weight pipe, the farmer should place the pipe on a board. A file is used to mark the pipe, and a chisel is used to make a light cut around the pipe. The pipe is rolled on the board as it is cut.

There are two kinds of joints that are used in connecting cast iron pipe. These are vertical and horizontal. The procedure to follow in making a vertical joint is as follows:

a. The hub is placed in an upright position.

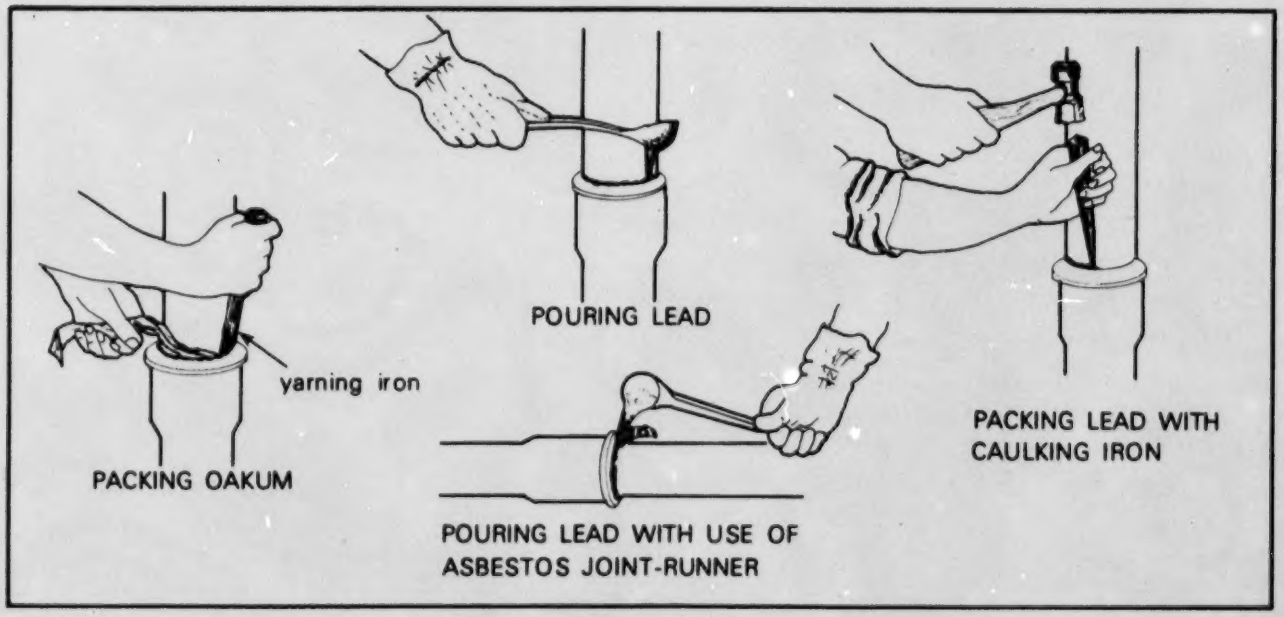
b. The pipe and joint are cleaned, and the spigot end is placed into the hub its full depth.

c. Oakum, a form of rope, is wrapped around the pipe and packed with the yarning iron. The joint is filled within 3/4 inch from the top of the hub. The oakum must be packed tightly and evenly to make a waterproof joint.

d. Molten lead is poured into and around the joint. Enough lead should be picked up in the ladle to fill the joint in one pouring.

e. The lead is allowed to cool, and the joint is calked (packed) to made it watertight. A hammer and calking iron are used for this.

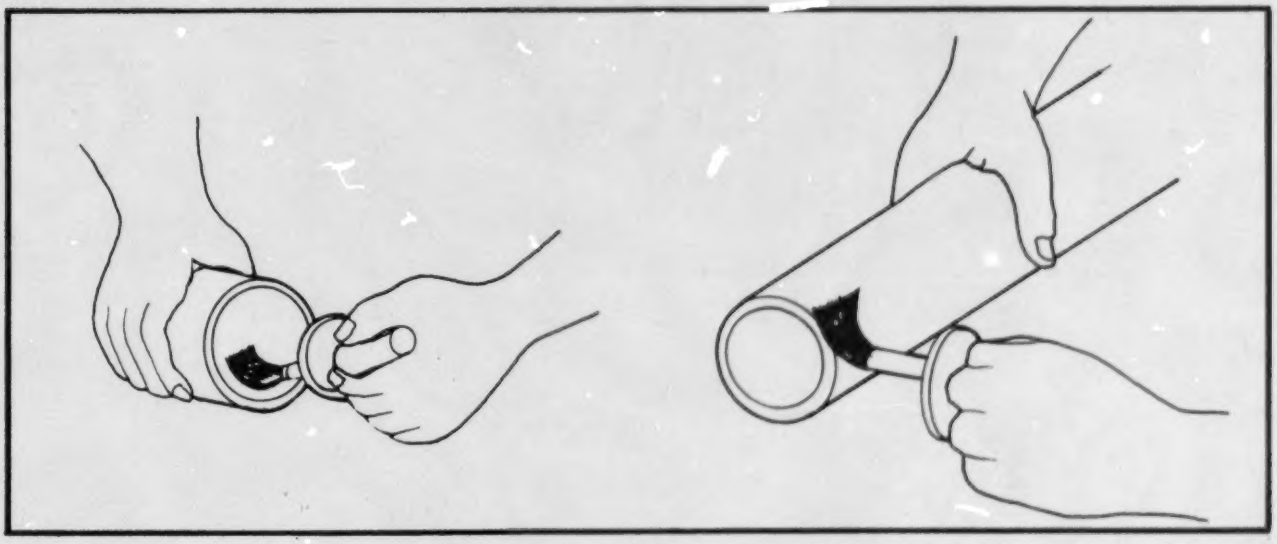
The procedure for assembling a horizontal joint is the same, except an asbestos joint runner is used to pour the lead in the hub.



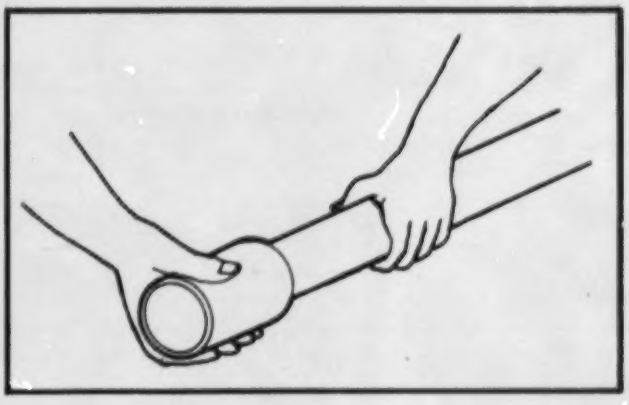
18. MAKING PLASTIC TO PLASTIC CONNECTIONS

Both the fitting socket surface and the surface of the pipe which will fit into the socket should be cleaned after the pipe is cut with a fine-toothed hacksaw blade and reamed with a pocket knife or reamer.

Using the proper solvent or cement for the type of pipe (standard or drainage plastic piping) and a non-synthetic bristle brush, apply the solvent or cement generously to the inside and outside of the surfaces to be fitted.



When the surfaces are completely and evenly covered with cement or solvent, press the pipe and fitting firmly together, turning the pipe 1/4-turn to evenly distribute the cement. Hold the pieces together for 15 seconds to allow curing to take place. Clean off the excess solvent. Check for accuracy and allow the connection to weld or set.



19. SEWAGE DISPOSAL SYSTEM

Plans for the sewage disposal system should be developed at the same time as the water system because an adequate sewage disposal system is necessary to safeguard health and prevent disease.

Sewage passes through three stages before it becomes harmless: sedimentation, decomposition, and purification. The solids are separated by the liquids in the sedimentation stage, while two types of bacterial action (aerobic and anaerobic decomposition) cause their decomposition. These bacteria will usually establish themselves in a septic tank; however, they may be purchased commercially and placed in the septic tank. The purification of sewage is accomplished as the liquid is aerated through the soil in the disposal field.

The most inexpensive method of sewage disposal for the farm home is a septic tank with an underground disposal system. However, in some areas it may not be possible to use this system. Heavy, impervious soil or a high water table will prevent the use of a septic tank. Before installing this type of sewage disposal, one should run a percolation test to determine if a septic tank and underground disposal system will function properly.

The three parts of a sewage system are the sewer line from the house to the septic tank, septic tank, and final disposal system. Each is discussed separately:

Sewer Line from the House to the Septic Tank - The length of the sewer line to the septic tank will be determined by the slope of the ground, location of house and well, and the disposal field. All sewer lines should be located to prevent contamination of the well by sewage.

The drain line should be laid in a straight line and at a uniform grade. The grade of the drain is determined by the size of the line, but not less than two feet per 100 feet of line is recommended for four-inch drain pipe. Less drop may be used on larger pipe. The pipe should be laid on firm soil.

Septic Tank - The septic tank can be purchased, or it may be constructed on the site. The size of the septic tank should be determined by the number of people in the family plus others that may be expected to use the system. It should be large enough to hold the sewage for three days. A daily allowance of forty gallons per person is usually made. The septic tank should be located down hill from the home and no closer than thirty feet.

The contents of a septic tank are composed of scum, liquid, and sludge. Grease and lighter solids rise to the top to form scum, and the heavier solids sink to the bottom. Liquid remains between. The outlet on the septic tank is constructed so as to prevent solids from leaving the tank.

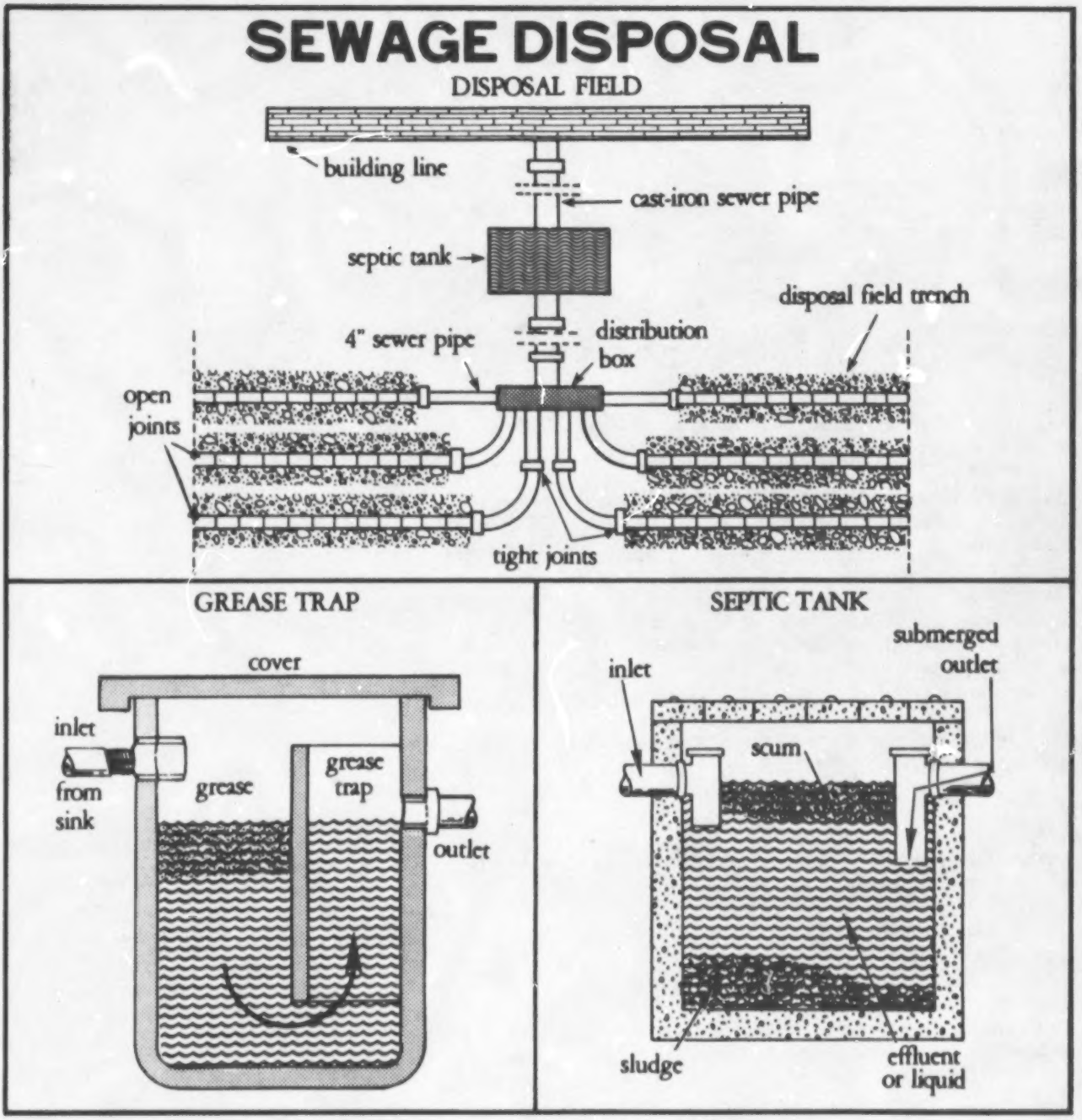
Final Disposal System - Since only liquid passes through the outlet line, it is not easily clogged; nevertheless, a grade of two feet for 100 feet should be used. This will increase its capacity and decrease the possibility of freezing.

The size of the disposal area is very important and is determined by the capacity of soil to absorb liquid, size of the disposal system, amount of liquid to be disposed, and size of trench where pipes are laid. There are several ways of running disposal lines, and they may be of cast iron, vitrified clay cement, or fiber tile. Some systems have the disposal lines running from a distribution box, while others have the lines running directly from the septic tank. Regardless of the layout of the disposal tile, one should have at least two runs of tile equal in length. The runs should not exceed 100 feet in distance.

The grease trap, which is connected to the kitchen sink and is another part of the waste disposal system, may be connected to the septic tank, or it may bypass the septic tank and go directly to the disposal lines.

Some farms need a liquid manure disposal system. If the fertility of the manure is utilized, a large septic tank can be built for this purpose. A mobile, liquid manure spreader will be needed to distribute the manure. Some farmers use lagoons, large ponds, to dispose of manure.

SEWAGE DISPOSAL



SUGGESTED STUDENT ACTIVITIES

I. Fill in the blank.

1. If the faucet seat is rough, it should be _____ with a seat dressing tool.

2. Leaks in pipes are caused by _____ or _____ from freezing, machinery, or animals.

3. The flush valve, inlet valve, and float valve are generally the parts of the _____ _____ that need repairing.

4. Five methods of clearing clogged drains and traps are: a. _____
   b. _____ c. _____
   d. _____ e. _____

5. Using chemicals to clean drains may result in breathing _____ fumes if care is not taken.

II. Discussion questions.

1. Explain and give an example of a gravity flow water system.

2. Explain and give an example of a pressure water system.

3. Name and list a use for five types of pipe.

4. Discuss how size of pipe for a particular job is determined.

5. Discuss fittings as to the purpose, types, and dimensions.

6. Give examples of valves and their uses.

7. Name several plumbing tools and a use for each.

8. Discuss measuring pipe.

III. Diagram the following plumbing symbols.

1. Water closet -

2. Shower stall -

3. Hot water heater-

4. Gas outlet -

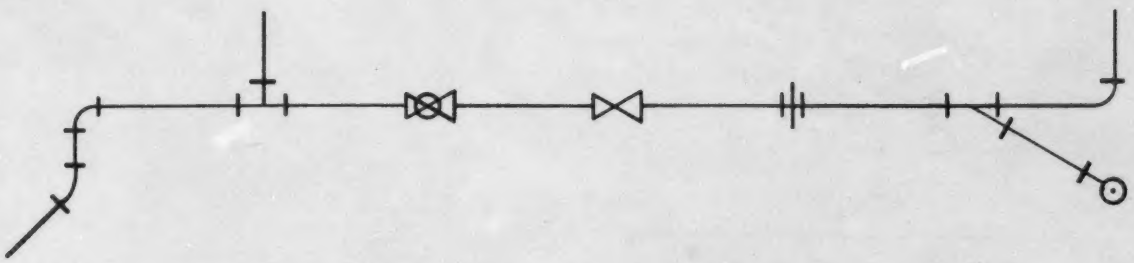
5. Elbow - 90 degree (screwed fitting)

6. Joint (soldered fitting) -

7. Tee (screwed fitting) -

8. Reducing elbow (soldered fitting) -

IV. Label the following single line drawing.



V. True or False.

_____ 1. Cutting oil should be used ahead of the die when threading pipe.

_____ 2. The sleeve nut cannot be slipped on a section of copper tubing after the ends have been flared.

_____ 3. Tubing fittings must be cleaned thoroughly before attempting to solder the joint.

_____ 4. When heat is properly applied, solder will flow by capillary action throughout the copper fitting joint.

_____ 5. Oakum and molten lead are used to seal the joint made in connecting cast iron pipe.

_____ 6. Plastic pipe connections are made with a solvent or cement, and should be held for approximately 15 seconds to allow curing to take place.

_____ 7. Sewage goes through three stages before it becomes harmless: sedimentation, decomposition, and purification.

_____ 8. Septic tanks should not be used in soils having a high water table.

_____ 9. Percolation tests should be run prior to installing a septic tank system.

_____ 10. A grade of two feet per 100 feet should be used for septic tank outlet lines.

ALL RIGHTS RESERVED

Reproduction prohibited without written permission.
Vocational Instructional Services
Texas A&M University
College Station, Texas 77843